

PROCEEDINGS
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THE SCALES OF THE BLENNIOID FISHES.

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In the *Annals and Magazine of Natural History*, September, 1912, Mr. C. Tate Regan has a valuable revision of the classification of the Blennioid fishes, which are included in a suborder Blennoidea, with three divisions known as Blenniiformes, Cliniformes, and Ophidiiformes. Having found the scales of the Ophidiiformes extremely interesting, I was anxious to add to my very scanty knowledge of the lepidology of the other groups. Mr. Regan has kindly sent me from the British Museum the scales of three species, representing two families of Cliniformes. Two other Cliniform genera are represented in material from the Woods Hole collection, one of them adding another family. The Blenniiformes include four families, of which I have one, the Anarrhichadidæ. The Blenniidæ have no scales.

BLENNIIFORMES.

Anarrhichadidæ.

Anarrhichas lupus. Woods Hole. The minute circular scales have a practically central nucleus, from which radii extend in every direction except apically, cutting the well-defined and coarse circular fibrillæ.

CLINIFORMES.

Clinidæ.

Clinus (Labrisomus) nuchipinnis. Caribbean Sea (British Museum). Scales oblong, relatively large, being about $3\frac{1}{3}$ mm. long and $2\frac{2}{3}$ broad. Nucleus less than a third of total length from apex; about 20 strong basal radii, others rudimentary; no lateral radii; basal margin shallowly crenulate; circuli strong, those in the basal field very minutely but distinctly denticulate on the inner (apicad) side; in the lateral field, where the circuli run longitudinally and are not cut by radii, the minute beading

or denticulation can only be seen with a high power of the microscope; apical field, from a little apical of the nucleus, thin, granular, without any circuli or radii.

Lepidoblennius haplodactylus. New South Wales (Brit. Mus.). Scales very small, the largest little over half a mm. diameter; broader than long, with the same apical field without radii or circuli as in *Clinus*; radii 9 to 12, basal, broadly cutting the very widely spaced circuli. This is simply a very degenerate scale of the *Clinus* type, looking entirely different because of its shape and few, widely spaced circuli, which are only about nine in number. The circuli are without beading.

Stichaeidae.

Dictyosoma temminckii. Japan (Brit. Mus.). Scales excessively minute, elongate-oval, about 800 microns long and hardly half as wide, the ends broadly rounded; circuli coarse, extending all around the scale; no distinct radii, but one or two irregular and imperfect ones in the basal region. The circuli show exceedingly minute and imperfectly developed beading.

Ulvaria subbifurcata. Scales of the same general type as those of *Dictyosoma*, but less degenerate, having several well defined basal radii and an apical thin field without radii or circuli.

Pholididae.

Pholis gunnellus. Scales minute, more or less circular to oval; radii lateral as well as basal. Scales of the same general character as those of *Anarrhichas*.

All the above are really degenerate scales except those of *Clinus*, which should indicate better than any of the others the affinities of the suborder. The description of the scales of *Clinus* given above will nearly apply to those of *Helicolenus dactylopterus* in the Scorpaenidae. In *Helicolenus* the radii are not so close together, and the apical field is ornamented with spots, representing broken up fragments of circuli, but the essential characters are practically as in *Clinus*. Other Scorpaenids are ctenoid, affording an excellent transition to the typical ctenoid scale of the Percoid fishes. Mr. Regan writes (in litt.): "That the Blennioids are modified Percoids seems almost indisputable;" and the scale characters of the Blenniiformes and especially Cliniformes support this view. Goodrich places the Scorpaeniformes next to the Blennioids, and while they may not occupy a strictly intermediate position between the Blennioids and the Percoids, they at least have the intermediate type of scales. It must also be said that there is nothing in the scales of the series described above to suggest that they are not related. In spite of superficial differences they conform to a single general type.

When we come to Regan's division 3, the Ophidiiformes, the case is very different. The scales are entirely of the Gadoid type. The very numerous radii extend all around the scale, and there is no apical area without circuli or radii. There is nothing whatever to indicate any

former ctenoid features. There is indeed a certain resemblance in structure between the scales of *Genypterus* and *Anarrhichas*, but it is probably not fundamental. Considering the scale-structure, together with the osteological characters mentioned by Regan, it seems that the Ophidiiformes should stand against the other two divisions combined. Thus the Blennioidea will include the Blenniiformes and Cliniformes, while the Ophidiiformes will go in a distinct suborder or superfamily Brotuloidea.

Mr. Regan expresses the opinion (in litt.) that "the Gadoids seem to have sprung from some more primitive group [than the Percoids], such as generalized Iniomi (Aulopidae) or Berycoids (near Polymixiidae)." It is recognized that the Brotuloidea are quite distinct from the Gadoids, but may they not represent still another independent branch, arising from fishes more specialized than the immediate ancestors of the Gadoids, yet without the ctenoid scales of the typical Percoids? It should be added that the scales of *Polymixia* are ctenoid, and are as different from those of the Gadoids as possible. I do not know the scales of Aulopidae, but those of the Synodontidae (*Trachinocephalus* and *Synodus*) show no Gadoid features.

Postscript.—Since the above was written I have received through the kindness of Dr. Edwin C. Starks scales of *Dactylagnus mundus* (Carmen I., Gulf of California; Albatross collections), a representative of the Dactyloscopidae. This family is placed by Regan in the Cliniformes, but has been referred by other authors to quite different groups. The scales are about 2 mm. long and $2\frac{1}{2}$ broad; nucleus considerably basad of the middle; radii basal, very numerous (over 40), extending to the sides of the base, only the middle ones reaching the nuclear area; basal margin not or hardly crenulated; basal circuli very numerous but irregular, cut by the radii; nuclear area, and the region basad of its level, finely ornamented with a pattern curiously simulating a finger-mark, composed of variously broken and anastomosing circuli; in the nuclear field producing irregular reticulations, but apically largely resolved into dots, the trend of the circuli mainly longitudinal, but spreading laterally, pointing at an angle of about 45° to the margin; apical margin of scale very thin, easily frayed or broken, finely granular. The lateral line canals are forked basally, forming a Y with very short arms and a long stem. By the position of the nucleus, this is very different from *Labrisomus*, but the general structural features are not dissimilar, and so far as it goes, the scale of *Dactylagnus* confirms the position of the fish in the Blennioidea. The Dactyloscopidae have been placed near the Uranoscopidae by Gill. Dr. Starks sends scales of *Uranoscopus scaber* which he collected at Naples, Italy. The very small ($1-1\frac{1}{3}$ mm. long) scales are covered by skin and scarcely at all imbricated. They are elongated, with the shape of an oyster shell, the apex obtusely pointed, the base broadly rounded. The nucleus is very near the apex, and from its vicinity run about ten long, partly broken, basal radii. The circuli are coarse and dense, not only interrupted by the radii, but considerably broken up in the apical field. This scale is entirely diverse from that of *Dactylagnus*, and does not suggest that of any Blennioid.